May 8, 1962 SEIICHI KITABAYASHI 3,033,473

DEVICE FOR EMITTING AGGLUTINATIVE MATERIAL

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Fig. 3

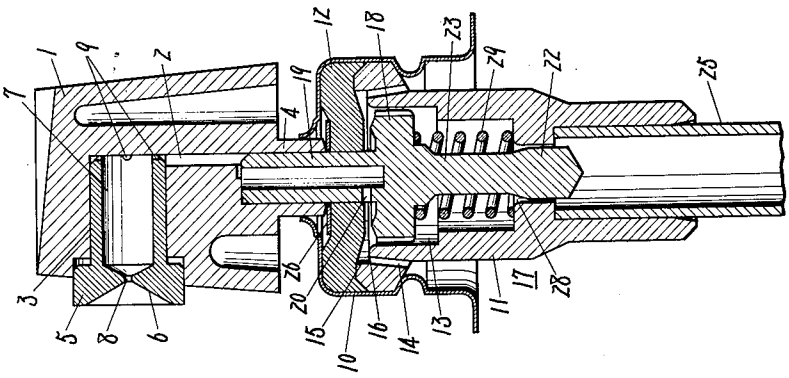


Fig. 2

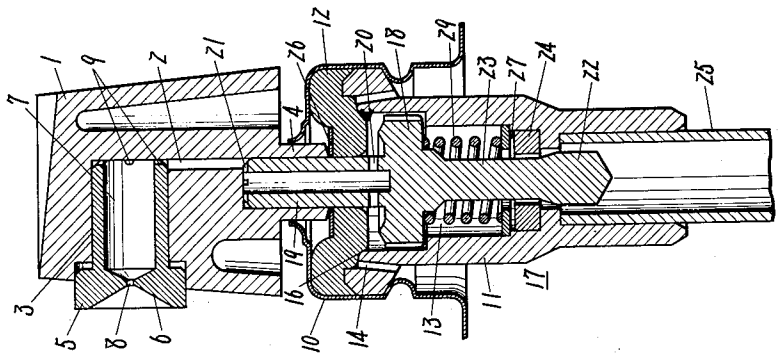
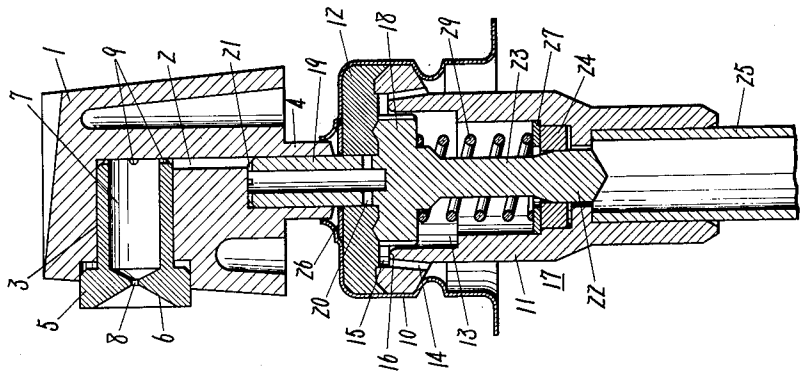


Fig. 1



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Fig. 4

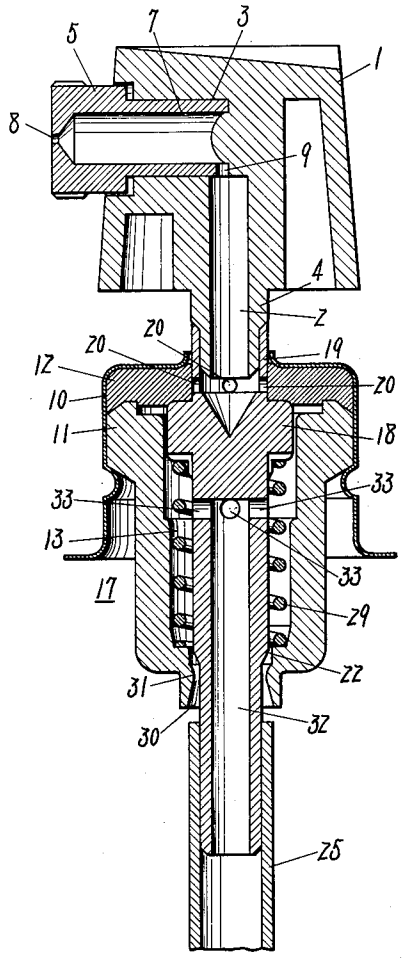
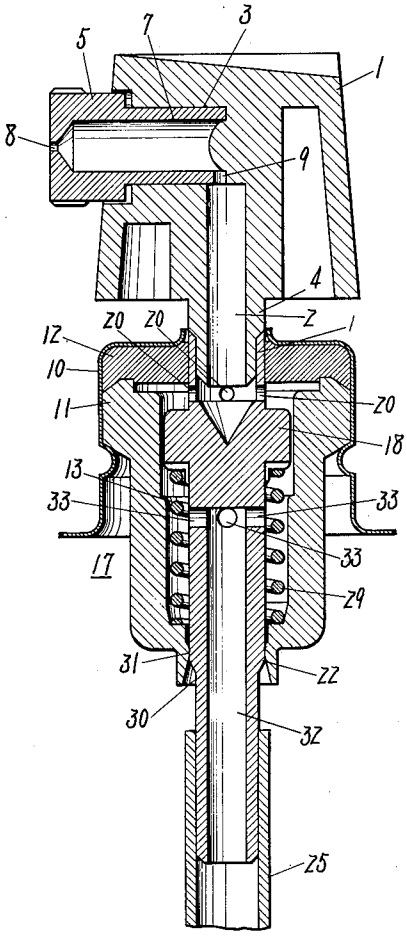


Fig. 5



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DEVICE FOR EMITTING AGGLUTINATIVE MATERIAL

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4 Claims. (Cl. 239—579)

The present invention relates to aerosol dispensers for emitting solution of agglutinative material such as sizings, paints or the like.

An object of the present invention is to provide the above mentioned devices in which trouble with the emission nozzle as well as passages for liquid therein getting clogged can be avoided.

Another object of the present invention is to provide said devices with which a fine sprayed mist is obtained.

Still another object of the present invention is to provide said devices of a simple structure.

A device according to the present invention comprises a reservoir containing a solution and a gas expellent, a push button provided with an emission nozzle and a passage being in communication with said nozzle and with the interior of the following valve, the lower end of said push button being connected with a valve stem of said valve, said valve being encased tightly within said reservoir by the top wall thereof and capable of placing said passage in said push button in communication with the upper interior of said reservoir in the initial and final stages of operation of the device, an eductor tube being in communication with the interior of said valve and with the bottom of said reservoir. Said operation of the device means the whole procedure of actions from the beginning of movement in said device to the ending thereof.

The embodiment of the present invention, illustrated in the accompanying drawings, will hereinafter be described.

In the drawings:

FIG. 1 is a longitudinal sectional view of a device according to the present invention fitted to the top wall of a reservoir and shown in its off position.

FIG. 2 is a longitudinal sectional view of the identical device with that shown in FIG. 1 shown in its operating position.

FIG. 3 is a longitudinal sectional view of another modification according to the present invention shown in its half-way state of operation.

FIG. 4 is a longitudinal sectional view of another modification according to the present invention shown in its off position.

FIG. 5 is a longitudinal sectional view of the identical device with that shown in FIG. 4 shown in its state of operation.

In FIG. 1 and FIG. 2 a push button **1** is provided with a passage **2** longitudinally through said push button. The lower end of said passage is in communication with the stem column **4** of the following valve stem **17** through the notches **21** of said stem pipe. The upper end of said passage opens in a corner of a hollow **3** which is provided laterally in said push button. Said push button extends downwards through the wall of said reservoir in forming stem column **4**. The lower end of said stem column is positioned so that said end may come in contact with the top of the following sealing gasket **12** upon downward movement of said stem column. A nozzle body **5** is provided with a conically indented front **6** and a hollowed rear **7** and is encased rotatably in said hollow **3**. Said front and rear are in communication with each other through a nozzle hole **8**. The rear end of said nozzle body is provided with notches **9**. The valve is encased tightly within said reservoir by the top wall **10** thereof around the periphery of a valve housing **11** and

around annular fixed sealing gasket **12** of a resilient material. The valve housing **11** is topped with said gasket **12** and is provided therein with a valve chamber **13**. The upper marginal portion of said valve housing is provided with pits **14**. Said pits are in communication with the uppermost portion **15** of said valve chamber at the top of the shoulder **16** in said valve housing and with upper interior **17** of said reservoir. Said shoulder **16** and said gasket **12** are positioned relatively that said gasket may come in contact with said shoulder upon inwardly yielding movement of said gasket. Said valve chamber contains the lower portion of a valve stem **18** and said stem is supported by a valve spring **29**. Said valve stem is topped with a stem pipe **19** in a body. Said stem pipe extends upwards through said sealing gasket **12** and is encased therein slidably. The lower endwall of said stem pipe is provided with side orifices **20**. Said orifices are positioned so that they may be shut by said gasket **12** at the off position. The upper portion of said stem pipe is encased in said stem column **4** and the push button **1** proper. The upper end of said stem pipe is provided with notches **21**. Said orifices **20**, said gasket **12** and said shoulder **16** are positioned relatively that said orifices may open in said valve chamber upon downward movement of said push button prior to contact of said gasket with said shoulder. The lowest portion of said valve stem **18** is provided with a bigger diameter than the lower middle portion **23** thereof and extends downwards through the bottom of said valve housing in forming a sliding plug **22** against an annular bottom gasket **24** which is encased within the bottom of said valve chamber under said valve spring **29**. Said sliding plug **22**, said shoulder **16** and said gasket **12** are positioned relatively that said plug may pass through said bottom gasket **24** before contact of the sealing gasket **12** with said shoulder **16** upon downward movement of said push button **1**. An eductor tube **25** is fitted against the bottom of the valve housing **11** in communication with bottom of said reservoir and for being in communication with said valve chamber **13**.

When the push button **1** is depressed the valve stem **18** moves downwards and the side orifices **20** open in the valve chamber **13** causing the upper interior **17** of the reservoir to communicate with the nozzle hole **8** through the pits **14**, the upper portion **15** of the valve chamber, the stem pipe **4**, the passage **2** and the notches **9**, with the result that said gas contained in said reservoir is emitted from said nozzle hole **8** and said nozzle hole is cleaned away as well as every passage through which said emitting gas passes.

The relative situation between the side orifices **20**, the sealing gasket **12** and the upper portion **15** of the valve chamber at this stage of operation is the same as is shown in FIG. 3.

Subsequently, the gasket **12** comes in contact with said shoulder **16** upon inwardly yielding movement of said gasket due to the depression by the lower end of the stem column **4**, in causing the communication of the valve chamber **13** with the upper interior **17** of said reservoir to cut off. Upon further depression of the push button **1** the sliding plug **22** passes through the bottom gasket **24**, causing the nozzle hole **8** to be in communication with bottom of said reservoir through the eductor tube **25**, the valve chamber **13**, the side orifices **20**, the stem pipe **19**, notches **21**, the passage **2** and the notches **9**, with the result that the liquid contained in said reservoir comes up to be emitted from the nozzle hole **8** due to pressure of said expellent gas.

The sprayed mist in the initial stage of emission of liquid is a rarefied and extremely fine one, consequent upon the relaying action of the discharging liquid for the preceding emitting gas. Said rarefied mist is a leading

factor in the smooth introduction of the full emission of liquid in growing always denser.

When the push button **1** is released said device begins to recover its original position. In the first place, the plug **22** cuts off the liquid from coming up into the valve chamber **13**, consequent upon the closure of the hole of the gasket **24** by said plug. Subsequently, the upper interior **17** of the reservoir comes in communication with the valve chamber **13**, consequent upon separation of the gasket **12** from the shoulder **16** due to the power of restitution of said resilient sealing gasket **12**. In this recovering stage, the side orifices **20** remain yet open in the valve chamber **13** and the expellent gas in the upper interior of the reservoir rushes out from the nozzle hole **8** through the upper portion **15** of the valve chamber and cleans off every passage on the way, in blowing the agglutinative liquid away. Subsequently, the side orifices **20** are closed by the sealing gasket **12** in completing the operation. The bottom valve which is composed of the sliding plug **22** and the bottom gasket **24** is placed so that the valve chamber may retain said liquid when the operation is over, and that the time required for next introduction of the full emission may be shortened.

The notches **9** at the rear end of the nozzle body **5** are provided so that the narrow passages below the passage **2** may be shut from outside, by rotating said nozzle body, when said device is not in use, and that said narrow passages may be prevented from the contamination with dust or the like.

In the figures, **26** and **27** are respectively a guard washer for the sealing gasket **12** and for the bottom gasket **24**.

In FIG. 3 another modification of the present invention is shown, in which no bottom gasket **24** which is present in the device of FIG. 1 and FIG. 2 is provided at the bottom of the valve chamber **13**, and the plug **22** passes through the bottom hole **28** of the valve housing **11** without coming in contact with the wall of said hole. Other parts in said device are substantially equal to those of the device of FIG. 1 and FIG. 2 as well as the constructions therewith. The features and the movement of parts in said device in operation is equal to those of the device of FIG. 1 and FIG. 2 except the relative movement of the plug **22** and the bottom portion of the valve housing **11**.

When the push button **1** is depressed the valve stem **18** moves downwards and the side orifices **20** open in the valve chamber **13**, in causing the upper interior **17** of the reservoir to communicate with the nozzle hole **8** through the pits **14**, the upper portion **15** of the valve chamber, the stem pipe **4**, the passage **2** and the notches **9**, with the result that said gas in the reservoir is emitted from said nozzle hole **8**, and said nozzle hole is cleaned away as well as every passage through which said emitting gas passes. In this stage of operation no liquid comes up through the eductor tube **25** due to the weight of said liquid. Subsequently, the sealing gasket **12** comes in contact with the shoulder **16** of the valve housing upon inwardly yielding movement of said gasket due to the depression by the lower end of the stem column **4**, in causing the communication of the valve chamber **13** with the upper interior **17** of the reservoir to cut off. Upon this, the liquid contained in the reservoir rushes up through the eductor tube **25** and the bottom hole **28** due to the pressure of gas in said reservoir, in causing the emission of liquid from the nozzle hole **8**.

The features of said sprayed mist are equal to those with the device of FIG. 1 and FIG. 2 as well as the merits thereof.

The recovering action of said device upon releasing of the push button **1** is equal to that of the device of FIG. 1 and FIG. 2 except that the bottom of the valve chamber **13** is not closed by the elevation of the valve stem **23**, and that when the gasket **12** comes to separate from the shoulder **16** the liquid present in the valve chamber **13** falls through the bottom hole **28**, on account of equalized pressure of upper interior of the reservoir and said valve chamber.

An advantage of said device against the device of FIG. 1 and FIG. 2 is that said device can stand a long period out of use on account of absence of agglutinative liquid in the valve chamber.

In FIG. 4 and FIG. 5 still another modification of the present invention is shown in which a push button **1** extends downwards in forming a stem column **4**. Said push button is provided with a passage **2** through said stem column. The lower end of said stem column is encased in the stem pipe **19** of the following valve stem **18**. The upper end of said passage opens in a corner of a hollow **3** which is provided laterally in said push button. A nozzle body **5** is encased rotatably in said hollow **3**. Said nozzle body is provided with a hollow rear **7** which is in communication with outside through a nozzle hole **8**. The rear end of said nozzle body is provided with a notch **9**. The valve is encased tightly within a reservoir by the top wall **10** thereof around the periphery of a valve housing **11** and around an annular sealing gasket **12**. The valve housing **11** is topped with said gasket **12** and is provided therein with a valve chamber **13** and is provided with an opening **30** at the bottom thereof. The side wall of said opening **30** forms a valve seat against the following plug **22**. Said valve chamber contains the middle portion of a valve stem **18**. Said valve stem is topped with a stem pipe **19** in a body and is supported by a valve spring **29**. Said stem pipe extends upwards through said sealing gasket **12** and is encased therein slidably. The lower end wall of said stem pipe is provided with side orifices **20**. Said orifices are positioned that they may be closed by said gasket **12** at the off position of the device. Said valve stem extends downwards through said opening **30** and the lower end thereof is connected firmly with an eductor tube **25** which leads to bottom of said reservoir. The lower and middle portions of said valve stem is provided with a passage **32** which is in communication with said valve chamber through side orifices **33** and with said eductor tube. The exterior wall of the middle portion of said valve stem forms a plug **22** against said valve seat **31**. Said side orifices **20**, said plug **22** and said valve seat **31** are positioned relatively so that said side orifices may open in said valve chamber in leading to contact of said plug with said valve seat upon downward movement of said valve stem.

When the push button **1** is depressed the valve stem **18** moves downwards and the side orifices **20** open in the valve chamber **13**, in causing the upper interior **17** of the reservoir to communicate with the nozzle hole **8** through the opening **30**, the valve chamber **13**, the orifices **20**, the passage **2** and the notch **9**, with the result that said expellent gas contained in said reservoir is emitted from said nozzle hole **8** and said nozzle hole is cleaned away as well as every passage through which said emitting gas passes.

Subsequently, the plug **22** comes in contact with the valve seat **31**, causing the communication of the valve chamber **13** with the upper interior **17** of said reservoir to be cut off. Upon this, said liquid in the reservoir comes up through the eductor tube **25**, the passage **32**, the side orifices **33**, the valve chamber **13**, the side orifices **20** and the passage **2** and is emitted through the nozzle hole **8**, consequent upon the pressure of said expellent gas upon the surface of said liquid.

The features of said sprayed mist is equal to those of the previously mentioned devices as well as the merits thereof.

When the push button **1** is released said device begins to recover its original position. In the first place, the plug **22** separates from the valve seat **31** in recovering the communication of said upper interior **17** of the reservoir with the valve chamber **13**, with the result that said expellent gas rushes out from the nozzle hole **8** through said valve chamber and through every passage

above said chamber in cleaning off said every passage on the way. Subsequently, the side orifices **20** are closed by the sealing gasket **12** in completing the operation. Upon this, said liquid remaining in the passage **32** and in the eductor tube **25** falls down due to its own weight in assuring complete evacuation of the whole system in said device.

The objects of the nozzle body **5** and the notch **9** are equal to those in the previously mentioned devices.

An advantage of said device against the previously mentioned devices is that said sealing gasket does not suffer a deterioration due to repeated bending, because the opening and closing of the passage between the valve chamber and the upper interior of the reservoir is not performed by an action of said sealing gasket but is performed by contact and separation of the plug against the valve housing. Another advantage of said device is that the valve chamber is completely evacuated due to rushing gas in the final stage of operation, because said gas enters into said valve chamber from the bottom of said valve chamber. Still another advantage of said device is that the coagulation of said agglutinative liquid at the lower end of the eductor tube is prevented by stirring actions due to repeated up-and-down movement of said eductor tube.

A device according to the present invention, as it is composed as stated above and as it is composed especially for the emission nozzle being in communication with upper interior of the reservoir in the initial stage of operation, the expellent gas contained in the reservoir is emitted by itself from the nozzle in cleaning away every narrow passage through which also the liquid in the reservoir will pass immediately after.

Any droplet of liquid does not remain in every narrow passage when the operation is over, because in the final stage of operation every part in said device takes an equal position to that in the initial stage of operation in blowing said droplet away by final rushing gas. Accordingly, the troubles which may be caused by agglutination of liquid are prevented. The spraying work with a device of this invention is extremely smooth and easy, because said initial emission of gas is followed by a rarefied mist in introducing a dense mist successively.

With above mentioned characteristics and merits, it is enabled by the present invention to provide aerosol dispensers most appropriate for emitting a solution of agglutinative material.

Having thus described my invention, what I claim is:

1. An aerosol dispenser for emitting agglutinative material, to be mounted on a reservoir containing a solution and a gas expellent, comprising a push button provided with a passage longitudinally through the same, said push button having a recess with said passage opening in a corner thereof, said push button having a stem column extending therefrom, a valve stem pipe mounted in said stem column in communication with said passage, a reservoir wall, a sealing gasket positioned against said wall beneath said stem column, a nozzle body provided with a conically indented front end and a hollowed rear end and encased rotatably in said push button recess with said front and rear ends being in communication with each other through a nozzle hole, the rear end of said nozzle having a notch, a valve housing topped by said gasket and provided therein with a valve chamber, said valve housing having upper marginal portions with bores therein being in communication with the uppermost portion of said valve chamber and exteriorly thereof, said valve housing having an interior shoulder in the uppermost portion thereof, said shoulder and said gasket being positioned relative to one another in order that said gasket will come in contact with said shoulder upon inwardly yielding movement of said gasket, said valve chamber containing the lower portion of said valve stem pipe, a valve spring supporting said valve stem pipe, said valve stem pipe extending through said sealing gasket and slideably encased therein, said valve stem pipe being provided with side orifices positioned for being shut by said sealing gasket at the off position, said side orifices, said sealing gasket and said shoulder of said valve housing being positioned relative to one another whereby said orifices will open in said valve chamber upon downward movement of said push button prior to contact of said gasket with said shoulder, said valve stem pipe being provided at its lowest portion with a plug slideably extending through the bottom of said valve housing while spaced from said housing, said sliding plug, said shoulder of said valve housing and said valve housing bottom being positioned relative to one another whereby said plug will pass through said housing bottom after contact of said sealing gasket with said shoulder upon downward movement of said push button, and an eductor tube to be placed in communication with the bottom of the reservoir, is connected with the bottom of said valve housing for being in communication with said valve chamber.

2. An aerosol dispenser as claimed in claim 1 wherein an annular gasket is positioned within said valve chamber bottom under said valve spring providing a valve seat for said plug extending therethrough.

3. An aerosol dispenser for emitting agglutinative material, to be mounted on a reservoir containing a solution and a gas expellent, comprising a push button having a stem column, and a passage through said stem column, a valve stem pipe having an end of said stem column encased therein, said push button having a lateral recess with said passage connected to a corner thereof, a nozzle body encased rotatably in said recess, said nozzle body being provided with a hollowed rear end in communication with the outside through a nozzle hole and having a notch therein, a sealing gasket, a valve housing being topped by said sealing gasket and having a valve chamber therein, a wall of the reservoir encasing said sealing gasket and valve housing, said valve housing having an opening in the bottom thereof forming a valve seat, a valve stem integral with said valve stem pipe and having a medial portion in said valve chamber, a valve spring supporting said valve stem, said valve stem pipe extending through said sealing gasket and slideably encased therein, said valve stem pipe having side orifices positioned for being closed by said sealing gasket at the off position of the dispenser, said valve stem extending through said valve chamber opening, an eductor tube for leading to the bottom of the reservoir and having said valve stem connected thereto, said valve stem having another passage in the lower and medial portions thereof in communication with said valve chamber through side orifices in said valve stem and with said eductor tube, the exterior wall of the medial portion of said valve stem forming a plug to be seated against said valve seat, said side orifices of said valve stem pipe, said plug and said valve seat being positioned relative to one another with said side orifices of said valve stem pipe opening into said valve chamber before contact of said plug with said valve seat upon inward movement of said stem.

4. An aerosol dispenser for emitting agglutinative material, to be mounted on a top wall of a reservoir for containing a solution and a gas expellent, comprising a push button provided with an emission nozzle and a passage being in communication with said nozzle, a valve stem connected to said push button and being in communication with said passage, a sealing gasket, a valve housing being topped by said sealing gasket and having a valve chamber therein, a top wall of the reservoir encasing said sealing gasket and said valve housing, a valve spring resiliently supporting said valve stem, said valve stem slideably extending through said sealing gasket and having at least one side orifice positioned for being normally closed

by said sealing gasket, said valve chamber having a passage for communicating with the upper interior of said reservoir and which passage is positioned for being opened by said valve stem only upon the initial and final operation of said push button and closed thereby at other times and means for connecting said valve chamber with the bottom of the reservoir.

References Cited in the file of this patent

UNITED STATES PATENTS

2,537,226	Lindsey	Jan. 9, 1951
2,704,582	Bowman	Mar. 22, 1955
2,818,202	Abplanalp	Dec. 31, 1957
2,952,278	Waldherr	Sept. 13, 1960